Dr. R. Sriprabha

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Professional Experience

Healthcare Technology Innovation Center (HTIC), IITM Research Park, Senior Project Engineer

(2020 to present)

- Collaborated for proposal writing on clinically motivated adaptive deep-learning solutions and led a successful research proposal jointly funded by GE Healthcare and SERB, raising HTIC's revenue by Rs. 44 Lakhs.

- **Generative AI**: Drove a workforce of 20 researchers in deep learning for imaging problems, analyzing AI domain adaptation capabilities. Built and validated generative models for image-to-image translation.

- **Inverse Imaging**: Self-started an innovative meta-learning research direction for data-driven image reconstruction, showcasing faster and more flexibility for multiple scanner parameters and degradation types and potentially **minimizing model retraining in orders of 100 to 2 or 3.** Built unified models and integrated over 40 unseen parameterized settings in a single model, trained on 5 parameterized imaging operators (e.g., arbitrary reconstruction and super-resolution), demonstrating higher generalization to unseen imaging parameters.

- Liaised with two neuroscience experts and spearheaded 3D block-face imaging and stacking of sliced fetal brain images to extract white matter fiber tracts. Formulated learning-based metrics to assess registration accuracy, achieving higher sensitivity and improving the registration scores with over 95% accuracy.

- Employed large, real-world challenge datasets with over 20+ publications in high-impact AI-focused journals (like Neurocomputing, Neural Networks) and top machine learning conferences (MIDL, IEEE ISBI, ICASSP, MICCAI workshops, CVPR, ICCV). Currently filing three patent IDFs.

(2017 to 2020) Team Lead

- Implemented **a suite of 30+ deep learning-based** approaches for image restoration, achieving over 90% accuracy.

- Applied **atlas-based segmentation** to segment 12 regions in the temporal bone data for cochlear implant surgery and led a team of 4 technical specialists for Eindhoven Medical Robotics.

- Analyzed data and applied learning-based approaches for object detection, showcasing 92% accuracy for GE Life Sciences.

(2016 to 2017) Lead

- Established two software utilities to edit surface meshes for surgical process workflow. Liaised with a team of verification engineers and obtained better interaction experience in 77% of trials.

- Incorporated and validated over 10 image post-processing techniques for real-time imaging systems.

(2013 to 2015) Project Engineer

- Built preoperative mandibulectomy surgery planning software to compute plate bending angles. The utility reduced mandibulectomy time from 4 to 3 hours and was successfully planned for eight subjects from Thalassery Cancer Centre.

- Managed axonal transport velocity estimation software in cellular processes for the Center for Biological Sciences, Bangalore. The module showcases a considerable reduction in manual delineation time by 89%.

- Brain-stormed and designed verification specification for ultrasound liver segmentation technique for Perfint Healthcare

HCL Technologies, Chennai, Senior Technical Specialist

(2011 to 2013)

- **Algorithm design, testing, and software integration:** Developed a PCA-based feature extraction module to detect the WBC buffy coat layer in centrifuged blood images for Therakos WBC Blood Separation System.

- **Proposal and FDA process:** Led a computer vision-based project proposal aimed at tracking the surgical probe tip for Covidien Laparoscopic Hernia repair. Generated the FDA process product design documentation for Terumo's optical frequency-domain coronary artery imaging system related to plague measurements.

Philips Healthcare, Bangalore, Technical Specialist

(2007 to 2010)

- Software development, bug fixing, verification, and validation testing on the Philips Medical Workspot framework for translational and oncology workstations. Recognized with two "You did it" awards for critical problem-solving.
- Was appraised by a team of experts from Philips, Aachen, for an invention disclosure on contour pre-processing techniques for accurate and smoother organ mesh generation.
- Pioneered multimodal medical imaging (CT, PET, SPECT, MRI) for rigid/non-rigid registration, transforming treatment planning in radiation oncology for personalized, evidence-based decisions and timely therapy assessment.

Industrial Consultancy and Sponsored Research (ICSR), IITM,   Design Engineer
(2002 to 2005)

- Established a standalone biometric fingerprint-matching software module for embedded DSP-based rural banking. Optimized feature extraction scheme for image registration, reducing computation time from 2 minutes to 5 milliseconds per user and creating a better user experience.
- Devised lightweight, affordable set-top boxes for rural Indian kiosks, enabling digital access with minimal hardware and over 15 software utilities through Linux-based kernel customization and file system optimization.

Education

- **Ph.D.**, Dept. of Electrical Engineering, **IIT, Madras**, July 2019 - July 2024, **CGPA 9.29**
- M.S, Dept. of Electrical Engineering, **CGPA - 8.7**, **IIT, Madras** 2004-2007
- B.E (ECE): 75% St. Joseph's College of Engineering, Madras University, Chennai 1996-2000

Technical Skillsets

Artificial Intelligence and Machine learning

- **Machine Learning Techniques:** Regression, Classification, SVM, GMM, SVD, PCA.
- **Neural Network Architectures:** MLP, CNNs, Vision Transformers, generative models - GANs, VAEs, DDPMs.
- **Meta-Learning:** Bi-level optimization, MAML, Siamese Networks.
- **Dynamic Weight Prediction:** Conditioning and context embedding, Network interpolation, Adaptive instance normalization, DCT/DFT-based weight prediction, Convolution feature modulation, Low-rank kernel modulation.
- **Knowledge Distillation:** Attention transfer, Student-friendly teacher.
- **Self-supervised Learning:** Physics-driven and measurement-constrained models.
- **Attention Mechanisms:** Spatial, Channel Squeeze-and-Excitation, Self-Attention.
- **Large Language Models (LLMs):** RNN, Hugging Face Transformers, PEFT.
- **Multimodal Learning:** Universal model combining multiple imaging modalities and numerical imaging operators.

Programming Tools

- **MLOps:** AWS Sagemaker
- **Imaging:** OpenCV, SimpleITK, VTK, Scikit-learn.
- **ML Framework:** C++, Python, MATLAB, PyTorch, NumPy, Pandas.
- **Configuration Management:** ClearCase, Git.
- **Project Management:** XNAT, Atlassian tools – Jira, Confluence, Trello.
- **Visualization:** ParaView, Matplotlib, C++/Python plugins for Slicer3D, MITK.

Selected Projects

- Transformers and foundation models for de-aliasing and image-to-image translation in medical imaging datasets, achieving approximately 80% SSIM accuracy in multi-contrast images.

- o Siamese networks with contrastive loss for image feature matching and registration quality assessment, exhibiting 53% improvement in sensitivity.
- o Developed brain-inspired spectral attention neural networks alongside frequency-based loss functions, enhancing model performance with a 1.07% accuracy increase and achieving a minimal 0.14% rise in FLOPS over baseline models.
- o Model-agnostic and multimodal meta-learning techniques to address heterogeneous image data, accommodating diverse variations (24 combinations) in contrasts, anatomies, coil configurations, and artifacts in image restoration. The approaches match expert models' performance trained for each combination, with SSIM improvements of over 0.01.
- o Controllable neural networks and decouple learning networks for multiple parameterized imaging operators.
- o Fast R-CNN-based lung nodule detection (Kaggle CT dataset) and clamp detection (annotated data) exhibiting precision and recall of over 80%

Awards

- o Institute Research Award 2023 - 24 (out of the 25 Awardees), Keshav Ranganath Award nominee (topmost award for research in IITM, one among the 13 nominees)
- o Prof. Malathi Veeraraghavan Fellowship Award 2022 and all-time title "MV Scholar"
- o Runner up Best Paper Award at the MIDL 2020 (one of the four awarded papers chosen from 18 long oral papers and over 150 overall papers.) with Magazine coverage at RSIP vision.
- o Honorable mention Reviewer and Session chair for MIDL 2021 conference study group for MIDL 2021
- o Tech Talks
    - o Dynamic weight prediction and meta-learning for MRI, University of Edinburgh (November 2024)
    - o Developing an AI-driven Acquisition-adaptive MRI scanner, EE Department Symposium at IITM (April 2024)
    - o "Recent Trends in Machine Learning", Sri Ramachandra Institute of Higher Education and Research, Chennai
    - o Surface Mesh Extraction and deformable model-based segmentation, Philips Healthcare.

Selected Publications

1. **Sriprabha Ramanarayanan**, Rahul G S, et al., SHFormer: Dynamic Spectral Filtering CNN and High-pass Kernel Generation Transformer for Adaptive MRI Reconstruction, **Neural Networks**, volume 187, July 2025, 107334

2. **Sriprabha Ramanarayanan**, Balamurali Murugesan, et al., MCI-HyperNet: A Multiple Contextual Information-based Adaptive Weight Learning Network for Controllable Image Reconstruction, **Neurocomputing, 2023**

3. **Sriprabha Ramanarayanan**, Arun Palla, et al. Generalizing supervised deep learning MRI reconstruction to multiple and unseen contrasts using meta-learning hypernetworks. **Applied Soft Computing**, page 110633, 2023

4. **Sriprabha Ramanarayanan**, Balamurali M, et al., MAC-ReconNet: A Multiple Acquisition Context based CNN for MRI Reconstruction using Dynamic Weight Prediction, **MIDL 2020**, (Paper Award, Oral)

5. **Sriprabha Ramanarayanan**, Mohammed Al Fahim, et al., HyperCoil-Recon: A Hypernetwork-based Adaptive Coil Configuration Task Switching Network for MRI Reconstruction, **ICCV,** CVAMD **2023**

6. Kishore Kumar, **Sriprabha Ramanarayanan**, et al., DCE-diff: Diffusion Model for Synthesis of Early and Late Dynamic Contrast-Enhanced MR Images from Non-Contrast Multimodal Inputs, **CVPRW 2024** DEF-AI-MIA